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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/537,955	RABE ET AL.	
	Examiner	Art Unit	
	ALLISON P. BERNSTEIN	2824	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 September 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *11,13,14 and 18-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *11,13,14 and 18-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Acknowledgment is made of applicant's amendment, filed on 21 September 2010. The changes and remarks disclosed therein have been considered.

Claims 11, 13, 14, 18-23 are pending in the application. Claims 11, 13, and 22 are currently amended. Claims 11, 13, and 22 are independent claims.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. **Claims 11, 13, and 20-23** are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakakima et al. (US 5,841,611) ("Sakakima") in view of Haratani et al. (US 6,144,524) ("Haratani").

3. **Regarding claim 11,** Sakakima discloses in figures 2B and 24 a magneto-resistive layer system comprising: a magneto-resistive layer stack (3, 2, 3' at bottom of figure 2B above 1); and a layer arrangement (3/2/1) situated in an environment of the magneto-resistive layer stack working on the basis of one of a GMR effect and an AMR effect, which generates a resulting magnetic field acting upon the magneto-resistive layer stack, the layer arrangement consisting of a first magnetic layer (3 at bottom of figure 2B), a second magnetic layer (1 at bottom of figure 2B above 2), and a non-magnetic intermediate layer (2 between 3 and 1 at bottom of figure 2B) separating the

first magnetic layer (3 at bottom of figure 2B) and the second magnetic layer (1 at bottom of figure 2B) from one another, the first magnetic layer (3) and the second magnetic layer (1) being ferromagnetically exchange-coupled via the intermediate layer (2); wherein one of: (a) the first magnetic layer (3) is a magnetically soft layer, made of CoFe, Co, and magnetic alloys containing these materials (column 4 lines 25-26), and the second magnetic layer (1) is a magnetically hard layer and (b) the first magnetic layer is a magnetically hard layer , and the second magnetic layer is a magnetically soft layer, made of CoFe, Co and magnetic alloys containing these materials; wherein the magneto-resistive layer stack (3/2/3') consists of a third magnetic layer (3'), a fourth magnetic layer (3) and a second non-magnetic intermediate layer (2) separating the third magnetic layer (3') and the fourth magnetic layer (3) from one another, and the non-magnetic intermediate layer (2) of the layer arrangement (3/2/1) and the second non-magnetic intermediate layer (2) of the magneto-resistive layer stack (3/2/3') at least one of (a) are made of the same material and (b) have a substantially equal thickness (column 4 lines 34-35); wherein the magneto-resistive layer stack (3/2/3') is directly situated on the layer arrangement (3/2/1) (in figure 2B layer arrangement 3/2/1 is directly on magneto-resistive stack 3'/2/3 at bottom of figure); wherein the layer arrangement has one of a (i) similar and (ii) identical temperature dependency as the magneto-resistive layer stack (the non-magnetic intermediate layer and the second non-magnetic intermediate layer are the same material; therefore, the layer arrangement and the magneto-resistive layer stack have a similar or identical temperature

dependency), wherein the magneto-resistive layer system comprises a single magneto-resistive layer stack (3/2/3') and a single layer arrangement (3/2/1).

4. Sakakima does /not disclose wherein the magnetically hard layer is made of CoSm; and wherein the non-magnetic intermediate layer is made of CuAgAu.

5. Haratani discloses a magnetically hard layer that is made of CoSm (column 6 lines 62-64) and a non-magnetic intermediate layer that is made of CuAgAu (column 5 lines 10-18).

6. At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify the device of Sakakima with a magnetically hard layer that is made of CoSm and a non-magnetic intermediate layer that is CuAgAu in view of the teachings of Haratani since Co alloys are commonly used in the art for hard magnetic layers and Cu, Ag, and Au and alloys of these are commonly used in the art for non-magnetic layers.

7. **Regarding claim 13,** Sakakima discloses in figure 24 a magneto-resistive layer system comprising: a magneto-resistive layer stack (including 102/103 above 101 at top of stack in figure 24); and a layer arrangement (101/102/101) situated in an environment of the magneto-resistive layer stack working on the basis of one of a GMR effect and an AMR effect, which generates a resulting magnetic field acting upon the magneto-resistive layer stack, the layer arrangement (101/102/101) including a first magnetic layer (including 101 below magneto-resistive stack), a second magnetic layer (including 101 below magneto-resistive stack), and a non-magnetic intermediate layer (including 102 below magneto-resistive stack) separating the first magnetic layer (including 101

below magneto-resistive stack) and the second magnetic layer (including 101 below magneto-resistive stack) from one another, the first magnetic layer and the second magnetic layer being ferromagnetically exchange-coupled via the intermediate layer; wherein each of the first magnetic layer (for example 101) and the second magnetic layer (for example 101) is a magnetically hard layer (column 38 line 15); wherein the magneto-resistive layer stack consists of a third magnetic layer (including 3' in figure 2B, see also column 16 lines 40-50 which discloses inserting a magnetic film on either one or both sides of magnetically hard layer 1 for the purpose of obtaining a larger MR ratio) and a fourth magnetic layer (including 103) which are separated from one another by a second non-magnetic intermediate layer (including 102), and the non-magnetic intermediate layer (102) of the layer arrangement and the second non-magnetic intermediate layer (102) of the magneto-resistive layer stack at least one of (a) are at least substantially made of the same material and (b) have a substantially equal thickness (column 4 lines 34-35); wherein the magneto-resistive layer stack is directly situated on the layer arrangement (inserting magnetic layer 3' on top of the uppermost magnetically hard layer 101 in figure 24 will result in the following stack: 101/102/101/3'/102/103, where 101/102/101 is the claimed layer arrangement and 3'/102/103 is the claimed magneto-resistive layer stack. Sakakima discloses in column 19 lines 27-31 that the addition of magnetic film 3' between a hard magnetic layer and a non-magnetic film can increase the magnetoresistance effect); wherein the layer arrangement has one of a (i) similar and (ii) identical temperature dependency as the magneto-resistive layer stack (the non-magnetic intermediate layer and the second non-

magnetic intermediate layer are the same material; therefore, the layer arrangement and the magneto-resistive layer stack have a similar or identical temperature dependency), wherein the magneto-resistive layer system comprises a single magneto-resistive layer stack (3'/102/103) and a single layer arrangement (101/102/101).

8. Sakakima does not disclose wherein the magnetically hard layer is made of CoSm; and wherein the non-magnetic intermediate layer is made of CuAgAu.

9. Haratani discloses a magnetically hard layer that is made of CoSm (column 6 lines 62-64) and a non-magnetic intermediate layer that is made of CuAgAu (column 5 lines 10-18).

10. At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify the device of Sakakima with a magnetically hard layer that is made of CoSm and a non-magnetic intermediate layer that is CuAgAu in view of the teachings of Haratani since Co alloys are commonly used in the art for hard magnetic layers and Cu, Ag, and Au and alloys of these are commonly used in the art for non-magnetic layers.

11. **Regarding claim 20,** the Sakakima/Haratani combination discloses, in figure 24, the magneto-resistive layer system according to claim 11, wherein, in response to a change in a temperature to which the magneto-resistive layer system (figure 24) is exposed, one of a changing sensitivity and a shifting working point of the magneto-resistive layer stack (including, for example, 103, 102, 103 at the top of the figure) with respect to an external magnetic field to be measured with respect to at least one of strength and direction, is at least partially compensated within a predefined temperature

interval by the resulting magnetic field generated by the layer arrangement (including 101/103, 102, and 101/103 below magneto-resistive stack), which also changes as a result of the temperature change (this is a recitation of intended use of the claimed invention).

12. **Regarding claim 21,** the Sakakima/Haratani combination discloses, in figure 24, the magneto-resistive layer system according to claim 20, wherein the compensation is performed completely and the temperature interval is -30°C to +200°C (this is a recitation of intended use of the claimed invention).

13. **Regarding claim 22,** Sakakima discloses, in figure 24, a sensor element comprising a magneto-resistive layer system, the magneto-resistive layer system including: a magneto-resistive layer stack (3, 2, 3' at bottom of figure 2B above 1); and a layer arrangement (3/2/1) situated in an environment of the magneto-resistive layer stack working on the basis of one of a GMR effect and an AMR effect, which generates a resulting magnetic field acting upon the magneto-resistive layer stack, the layer arrangement consisting of a first magnetic layer (3 at bottom of figure 2B), a second magnetic layer (1 at bottom of figure 2B above 2), and a non-magnetic intermediate layer (2 at bottom of figure 2B) separating the first magnetic layer (3) and the second magnetic layer (1) from one another, the first magnetic layer (3) and the second magnetic layer (1) being ferromagnetically exchange-coupled via the intermediate layer (2); wherein one of: (a) the first magnetic layer (3) is a magnetically soft layer, made of CoFe, Co, and magnetic alloys containing these materials (column 4 lines 25-26), and the second magnetic layer (1) is a magnetically hard layer (column 4 lines 40-41) and

(b) the first magnetic layer is a magnetically hard layer, and the second magnetic layer is a magnetically soft layer, made of CoFe, Co and magnetic alloys containing these materials; wherein the magneto-resistive layer stack (3/2/3') has a third magnetic layer (3') and a fourth magnetic layer (3) which are separated from one another by a second non-magnetic intermediate layer (2), and the non-magnetic intermediate layer (2) of the layer arrangement and the second non-magnetic intermediate layer (2) of the magneto-resistive layer stack at least one of (a) are at least substantially made of the same material and (b) have a substantially equal thickness (column 4 lines 34-35); wherein the magneto-resistive layer stack is directly situated on the layer arrangement (in figure 2B layer arrangement 3/2/1 is directly on magneto-resistive stack 3'/2/3); wherein the layer arrangement has one of a (i) similar and (ii) identical temperature dependency as the magneto-resistive layer stack (the non-magnetic intermediate layer and the second non-magnetic intermediate layer are the same material; therefore, the layer arrangement and the magneto-resistive layer stack have a similar or identical temperature dependency), wherein the magneto-resistive layer system comprises a single magneto-resistive layer stack (3/2/3') and a single layer arrangement (3/2/1).

14. Sakakima does not disclose wherein the magnetically hard layer is made of CoSm; and wherein the non-magnetic intermediate layer is made of CuAgAu.

15. Haratani discloses a magnetically hard layer that is made of CoSm (column 6 lines 62-64) and a non-magnetic intermediate layer that is made of CuAgAu (column 5 lines 10-18).

16. At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify the device of Sakakima with a magnetically hard layer that is made of CoSm and a non-magnetic intermediate layer that is CuAgAu in view of the teachings of Haratani since Co alloys are commonly used in the art for hard magnetic layers and Cu, Ag, and Au and alloys of these are commonly used in the art for non-magnetic layers.

17. **Regarding claim 23,** the Sakakima/Haratani combination discloses, in figure 24, the sensor element according to claim 22, wherein the sensor element is for detecting magnetic fields with respect to at least one of strength and direction (this is a recitation of intended use of the claimed invention).

18. **Claims 14, 18, and 19** are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakakima et al. (US 5,841,611) ("Sakakima") in view of Haratani et al. (US 6,144,524) ("Haratani") as applied to claim 11 above, and further in view of Den (US 6,611,034).

19. **Regarding claim 14,** the Sakakima/Haratani combination discloses the magneto-resistive layer system according to claim 11.

20. The Sakakima/Haratani combination does not disclose expressly wherein the first magnetic layer has a different thickness than the second magnetic layer.

21. Den discloses, in figure 2B, the magneto-resistive layer system according to claim 11, wherein the first magnetic layer (16) has a different thickness than the second magnetic layer (17) (column 5 lines 25-27).

22. At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify the device of Sakakima/Haratani with a first magnetic layer that has a different thickness than the second magnetic layer in view of the teachings of Den for the purpose of increasing the stability of the hard (i.e. thicker) magnetic layer (column 7 lines 10-20 of Den).

23. **Regarding claim 18,** the Sakakima/Haratani/Den combination further discloses, in figure 2B of Den, the magneto-resistive layer system according to claim 11, wherein at least one of the first magnetic layer and the second magnetic layer has a thickness between 10 nm and 100 nm (column 6 lines 25-30 of Den).

24. **Regarding claim 19,** the Sakakima/Haratani/Den combination further discloses, in figure 2B of Den, the magneto-resistive layer system according to claim 18, wherein the thickness is between 20 nm and 50 nm (column 6 lines 25-30 of Den).

Response to Arguments

25. Applicant's arguments filed 21 September 2010 have been fully considered but they are not persuasive.

26. Applicant argues that the figures relied on by the examiner provide more layers than that of the present invention. Applicant further argues that the layer arrangement of Figure 24 includes four magnetic layers (101, 101, 103, 103) and three nonmagnetic layers (102, 102, 102).

27. In response, the term “comprising” is open-ended and therefore does not preclude additional layers or elements from being present. In figure 2B of Sakakima the

magneto-resistive layer stack consists of layers 3/2/3' and the layer arrangement consists of layers 3/2/1 even though the structure comprises additional layers. In figure 24, only layers 101/102/101 are relied on to teach the "layer arrangement", the other layers that Applicant refers to are within the same structure but are not considered part of the claimed "layer arrangement".

28. Applicant argues that the magneto-resistive layer stack of Sakakima has an additional non-magnetic layer beneath the lower magnetic layer.

29. In response, layers above or below the magneto-resistive layer stack are considered to be adjacent to the magneto-resistive layer stack but are not considered to be part of the magneto-resistive layer stack.

30. Applicant argues that figure 2B comprises more than a single magneto-resistive layer stack and a single layer arrangement.

31. In response, the claim recites "the magneto-resistive layer system **comprises** a single magneto-resistive layer stack and a single layer arrangement" (emphasis added). The term "comprising" or "comprises" is open-ended and therefore does not preclude additional layers or elements from being present. The magneto-resistive layer system of Sakakima **comprises** a single magneto-resistive layer stack and a single layer arrangement and additional layers.

Conclusion

32. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ALLISON P. BERNSTEIN whose telephone number is (571)272-9011. The examiner can normally be reached on M-Th 5:30am-4pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Elms can be reached on 571-272-1869. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

APB

/ANH PHUNG/
Primary Examiner, Art Unit 2824